

[No. 20]

CIVIL DEFENSE—FALLOUT SHELTER  
PROGRAM

HEARINGS

BEFORE

SUBCOMMITTEE NO. 3

COMMITTEE ON ARMED SERVICES

HOUSE OF REPRESENTATIVES

EIGHTY-EIGHTH CONGRESS

FIRST SESSION

PURSUANT TO

H.R. 3516

TO FURTHER AMEND THE FEDERAL CIVIL DEFENSE ACT  
OF 1950, AS AMENDED, TO PROVIDE FOR SHELTER IN FED-  
ERAL STRUCTURES, TO AUTHORIZE PAYMENT TOWARD  
THE CONSTRUCTION OR MODIFICATION OF APPROVED  
PUBLIC SHELTER SPACE, AND FOR OTHER PURPOSES

JUNE 3, 4, 5, 6, 10, 11, 12, 17, 21, 24, 25, 26, 27, JULY 10, 11, 17, 18,  
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Part II (Volume 2)



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Mr. PITTMAN. Yes. Do each of you have a copy of the paper on fire?

Mr. HÉBERT. That is what I am checking on now. All members have a copy?

Mr. KELLEHER. Yes; they do.

Mr. HÉBERT. Yes. You may proceed.

Dr. STROPE. Thank you.

#### STATEMENT OF DR. WALLACE E. STROPE, DIRECTOR FOR RESEARCH OFFICE OF CIVIL DEFENSE

Dr. STROPE. Mr. Chairman, gentlemen: Several witnesses before this subcommittee have advanced the thesis that the real civil defense problem is fire following nuclear attack rather than fallout and, indeed, that high-altitude detonations would be a more likely mode of attack against cities and populations in general.

#### DR. SCHREIBER'S TESTIMONY

Dr. Schreiber, of MIT, was particularly positive on this point. He summarized his position in the following way:

As long as their capacity to deliver nuclear weapons by ICBM's remains limited, the Soviets would almost certainly use high-altitude airbursts of large bombs against cities, causing no fallout whatever but blasting and burning vast areas around their targets.

The detonation that Dr. Schreiber predicted in his testimony, which was a 30-megaton explosion at an altitude of 17 miles, would indeed cause no close-in fallout. All of the fallout would eventually be in the form of worldwide fallout. Neither would it produce significant blast effects on the surface below. Its entire capability to harm a city would lie in its supposed fire-producing potential.

#### PURPOSE

It is my purpose to show that the fire threat from the detonation postulated by Dr. Schreiber would be small under ideal conditions and would be negligible under most conditions. It is further desired to set the record straight on the dimensions of the fire threat as seen by the Department of Defense and to discuss the reasons why the use of nuclear weapons primarily for incendiary effects is unlikely.

#### IGNITION THRESHOLD

One of the major factors affecting the fire-making potential of nuclear weapons is the ignition threshold for various combustible materials. This is a major point at which Dr. Schreiber went wrong in his calculations.

Curiously, he selected 12 calories per square centimeter as his criterion on the basis that this energy would cause serious skin burns to people exposed to the heat flash although this fact bears no direct relationship to the question of ignition of fires. He assumed that it did. However, he would get considerable support for his choice of ignition thresholds from the information cited in table 7.44 of the "Effects of Nuclear Weapons" (ENW), the document prepared by the Department of Defense from which Dr. Schreiber took his data.

For example, this table indicates that for a 10-megaton airburst, the ignition threshold for newspaper is about 6 to 8 calories per square centimeter. This is not inconsistent with the 6 and 12 calories per square centimeter used by Dr. Schreiber.

#### NEW DATA

It so happens that at the time the current edition of the "Effects of Nuclear Weapons" was being prepared, in 1961, there existed new experimental data on the ignition thresholds for high-yield weapons obtained by the Naval Radiological Defense Laboratory that indicated that the information in the "Effects of Nuclear Weapons" was much too low. These data were published in unclassified form in 1959 and if Dr. Schreiber had looked for them, he would have found them. They differed so markedly, however, from the older information upon which the ENW was based that it was decided within the Department of Defense not to change the numbers until a new set of measurements could be obtained to corroborate the NRDL data. The new measurements have been completed within the past year by the Naval Materials Laboratory in New York and fully corroborate the NRDL findings.

This committee is aware, I am sure, that the Department of Defense maintains a classified publication called the "Capabilities of Atomic Weapons" as well as the unclassified "Effects of Nuclear Weapons." Both publications are prepared by the Defense Atomic Support Agency, which is the DOD agency concerned with obtaining information on nuclear weapon effects. The new information is so convincing that it is being incorporated into the classified publication and consideration is being given currently to issuing a correction to the "Effects of Nuclear Weapons" prior to its next revision date.

The new information shows that the ignition threshold for newsprint, which is among the most flammable materials likely to be exposed to thermal radiation, is about 34 calories per square centimeter rather than the 6 to 8 calories per square centimeter listed in the current edition of the Effects of Nuclear Weapons. This change, which has been suspected since 1959 and is now confirmed, markedly changes the sort of calculation attempted by Dr. Schreiber.

For example, his 30-megaton weapon detonated at an altitude of 17 miles barely exceeds the new ignition thresholds directly under the weapon and would ignite newspapers, for example, only within a radius of about 5 miles on a very clear day. As I will show shortly, the effects would be negligible under many other conditions.

#### RELATION OF OPTIMUM HEIGHT OF BURST FOR THERMAL RADIATION TO OPTIMUM HEIGHT FOR BLAST

The Defense Atomic Support Agency advises us that the optimum height of burst for thermal radiation has not been an object of study since the fire potential of a nuclear weapon has always been considered a bonus effect and one that is not readily predictable. However, in view of the question raised by Dr. Schreiber, such as analysis has been made by the Defense Atomic Support Agency and shows that the height of burst that maximizes the ignition radius is very nearly the same as the height of burst that maximizes low blast overpressures.



The results have been included, as Secretary Pittman mentioned, in the footnote to the charts on pages 2 and 3 of the yellow booklet provided to the committee. Those numbers then represent the maximum ranges on a clear day for thermal radiation for any condition of burst for the weapons indicated. In fact, as Secretary Pittman noted, it is only for a surface burst that ignitions can be expected in the light damage region. This is because the range of low overpressure is reduced below that of the airburst more than is the ignition radius.

#### EFFECT OF ATMOSPHERE ON TRANSMISSION OF THERMAL EFFECT

Now, another serious problem affecting the reliability of estimates of the incendiary effect of nuclear weapons has to do with the range of action of the thermal effect; that is, how it is degraded and reduced in passing through the atmosphere.

Dr. Schreiber uses the information in the Effects of Nuclear Weapons indiscriminately, even though it is clearly stated in the Effects of Nuclear Weapons that the data and equations used are reliable only within a distance equal to one-half the visibility of the atmosphere. Since the average visibility in metropolitan areas is about 10 miles, this means that all distances quoted over about 5 miles are open to question.

As noted on pages 321 and 362 of the Effects of Nuclear Weapons, the transmission equations overstate the range of thermal radiation effects by an unknown but possibly large factor. I call this fact to the committee's attention because, although the Department of Defense is not prepared to recommend a change at this time, additional research can only result in a further reduction of the current estimates of fire ignition.

#### EFFECTS OF WEATHER AND CLIMATE

I would like to complete the story of the uncertainties confronting the designer of a high-yield, high altitude incendiary weapon system for use in attacking the United States, or any other area, for that matter, by mentioning the problem of weather and climate. Weather and climate enter the nuclear fire problem in several important ways. The transmission of the thermal energy from the burst to the target area is strongly affected by the presence or absence of clouds, their types and locations, by visibility, by surface reflectivity, and by other meteorological factors. The ignitability of the materials in the target area and the possibility of spread of fires after initial ignition are directly influenced by the weather conditions at the time of attack and during a number of weeks preceding attack.

#### EXTENT OF CLOUD COVER

For high-altitude detonations, a critical factor is the amount of cloud cover between the weapon and the target area. Cloud transmission of thermal radiation, assuming 100 percent for a clear day, is about 30 percent for light cloud to about 3 percent for dense cloud, based on solar radiation data.

A detailed analysis of cities of 100,000 population or larger shows us that the average city has but 120 clear days a year and less than 10 percent have as much as 200 days. The average American city

has about 120 days of heavy cloud and over 100 days a year it is raining. Thus, for the average American city, the high-altitude incendiary weapon system would be fully effective one-third of the time, partially effective one-third of the time, and completely ineffective one-third of the time.

No military planner would be satisfied with a weapon system of such low reliability. However, it might be considered that, even so, he might wait, he might try to choose a particularly advantageous day for the attack, but unfortunately the condition when the skies are clear simultaneously over all or nearly all of our major cities is extremely infrequent and hard to predict.

Most of the time some of our cities have clear skies and others have cloudy skies. So the Soviet planner would have to settle for an uncertain chance of starting fires in some fraction of our cities as a result of attacks on all of them.

I happened this morning to pull out of the paper the weather map which is in the paper. I have saved an earlier map for the 27th of June as well.

It is quite interesting in looking at the 27th of June that it is raining in New England, there are heavy clouds in Boston, partly cloudy in Buffalo; New York and Washington are clear, but over in Wisconsin and Minnesota it is raining, it is raining in the South, Tampa, Miami are in the rain area, it is cloudy in Jacksonville, Nashville, Houston, and Galveston, it is raining there; it is raining in Seattle. It is cloudy in Portland; it is clear in Salt Lake City; it is clear in Kansas City. Denver is clear also. In Iowa it is cloudy. Today's map has very similar information spread about the country, but in different locations.

This basic difficulty facing the high-altitude incendiary attack is summarized in the map (enclosed) which shows the percentage of time





that "opaque" cloudiness occurs in various parts of the country. Since industry and population need a reliable source of fresh water, most of our cities are located in regions of high rainfall and, consequently, in areas where cloudy conditions are common.

There is considerable uncertainty about the extent of ignition of fires, as I have stated, but current information clearly supports the statement of Secretary Pittman in earlier testimony to the effect that the major fire threat would be in areas of extensive blast damage.

#### FIRE RESEARCH BY THE OFFICE OF CIVIL DEFENSE

Furthermore, any changes from additional research are expected to result in further reduction of the current estimates. This does not mean that the Office of Civil Defense is not aware of the importance of fire defense. A large part of our research effort is directed toward the development of measures to mitigate fire damage.

At the present time the OCD finances more fire research than any other organization in this country. We believe that this effort gives us the best understanding of the fire threat available today.

#### THE RELATION OF THE SHELTER SYSTEM TO FIRE DEFENSE

The position advanced by the Department of Defense is that an effective system of fallout shelters is an essential element of any reasonable civil defense effort and that there are low-cost ways of achieving this essential protection. In urging this program, it has never been implied that it is a panacea, that it would provide protection in the impact area, or that emphasis on achieving fallout protection left no room for other important functions of civil defense, such as warning, fire defense, rescue, medical aid, monitoring, and communications.

These are also important parts of the civil defense system.

What we do believe is that these functions will be most effective if founded on the firm base of an operational shelter system, and this is particularly true of fire defense.

We can expect large numbers of survivors in shelters—even the shelters now being marked and stocked—in the fringe areas of blast and heat around a surface nuclear detonation. In the first place, these shelters offer complete protection against the flash burns that Dr. Schreiber used as his criterion of effectiveness for thermal radiation. They also provide a small but significant degree of protection against blast, even though they are classed as fallout shelters. Therefore, we would expect many survivors in the region of 1 to 7 pounds per square inch blast overpressure.

For a 5-megaton surface detonation, as you can note from the yellow booklet, this region of moderate and light damage extends from 4 to 9 miles from ground zero and includes most of the damaged area.

It is in this region of survival that the secondary threat of developing fires from ignitions caused both by blast and thermal radiation will be encountered. The most promising time to control this threat is in the first half hour after attack when the ignitions are small and capable of being snuffed out. This is corroborated by historical experience at Hiroshima.

## FIREFIGHTING AT HIROSHIMA

At Hiroshima, very little firefighting was reported inside the larger reinforced concrete buildings that survived the explosion, some at very close range. Most survivors apparently fled to safer locations quickly. However, in at least four instances, people remained on fireguard and effectively prevented extensive fire damage by extinguishing incipient fires.

An outstanding example was Building No. 24 on the records of the U.S. Strategic Bombing Survey, which was located only a quarter mile from ground zero. Here, about a dozen people remained in the building, snuffed out fires, and survived in the heart of the Hiroshima firestorm area. This incident, and others, show more than the obvious point that fireguard actions in snuffing out small fires are really feasible and effective. They also indicate that such action can be effective in a particular building despite fires in other buildings in the same general region.

The existence of a community shelter system is the foundation upon which this type of emergency action can be built. When people are brought together or assigned to community shelters, they become available for organization, for assignment to functions, and for training to do vital tasks. Research is underway to develop the proper basis for these actions.

## METHODS OF FIRE DEFENSE

We are also studying various means of markedly reducing the fire vulnerability of urban areas. These measures, most of which are quite simple, are being considered for incorporation into emergency plans. Also, as Secretary Pittman mentioned in previous testimony, we are exploring and developing active thermal countermeasures—devices that would interfere with the arrival of thermal radiation at the target.

We would expect to concentrate these measures in areas of high fire susceptibility and in regions of high industrial value. An effective system seems to be achievable in the short term with an initiation time of 2 minutes and a sustaining time of 6 hours for about \$200,000 per square mile protected. We expect to reduce costs considerably through further developmental work.

In reacting to Secretary Pittman's statements on this matter, Dr. Schreiber said that a crash research and development program to translate these prospects into reality would be worth more than the fallout shelter program. We see no reason to make a choice here and we intend to pursue both. But it does highlight the fatal flaw in Dr. Schreiber's argument.

## RELATION OF SOVIET USE OF THERMAL EFFECT TO EFFECTIVENESS OF SHELTER SYSTEM

Thermal radiation is the most fragile effect of a nuclear detonation. Any opaque substance stops it completely. Even modest weather changes make marked changes in its effectiveness. If the Soviets were to commit themselves to the sort of weapon system Dr. Schreiber suggests, the potential effectiveness of civil defense would be sharply



increased. We don't think they are likely to make such a mistake.

Thank you very much, gentlemen.

Mr. HÉBERT. Thank you very much.

Mr. PITTMAN. Let me supplement, if I could, with one comment, Mr. Chairman.

#### FIRE DEFENSE AND THE SHELTER SYSTEM

Dr. Schreiber, in making a statement that a fallout shelter system could actually cost more lives than it saves in a fire environment was assuming that people would move like dumb animals into the designated shelter areas with no leadership or initiative to step outside in the event that the building was on fire or to move out to fight nearby fires.

I just want to assure you that the operating doctrine that goes with the shelter system is more flexible than this. That the instructions put out from civil defense authorities would tell people how to move out and fight fires and to do so with a minimum exposure to radiation. So we anticipate the use of shelters as a base for firefighting, not necessarily locking people in there to be cremated as was supposed in this testimony that we are referring to.

Mr. HÉBERT. I think at this point, Mr. Secretary, if any member of the committee has any question to ask Dr. Strobe, it would be well to proceed.

Mr. COHELAN. Mr. Chairman.

Mr. HÉBERT. Mr. Cohelan.

#### FIRE EFFECTS OF WORLD WAR II BOMBING

Mr. COHELAN. Mr. Pittman, do you have any studies in the department on fire damage and effects of our bombing raids say on Hamburg or Tokyo, and so on?

Mr. PITTMAN. We do, and Dr. Strobe is familiar with them; if you want he can——

Mr. COHELAN. Yes. I think it is relevant at this point.

Dr. STROPE. Yes. The detailed information is in the reports of the strategic bombing survey. These reports initially were classified. They are now unclassified. They indicate that the incident at Hamburg was probably the most severe fire condition that has ever been encountered and yet it is instructive that, although there are still questions about the exact numbers, in this case at least 85 percent of the estimated people within the fire storm region survived. Some of these people left the area, but most of them did not.

Part of them were protected by rather good shelters called bunkers, but most of them were not. Mention was made in the testimony about the fact that survival could be explained because the canals helped them out, but this is simply an acknowledgment of the fact that in every city there are areas of high susceptibility and low susceptibility and that canals and wide streets and parks and so forth do exist and that people have a high survivability under these conditions.

#### SHELTERS AND FIRE

Mr. COHELAN. How about the basement environment in buildings?

Dr. STROPE. In load-bearing brick buildings, particularly those

that were also struck with high explosives and demolished, is where it is believed that a large part of the victims were lost—although there were survivors in these circumstances also. These were obviously the weakest conditions in Hamburg. These were in essentially individual dwellings.

Mr. COHELAN. But the fact of the matter is, there were a lot of people lost in the basement environment as a result of fire and other effects?

Dr. STROPE. That is correct.

Mr. COHELAN. The building falling itself, and all the rest. But now, do you have any quantitative data on those situations? I mean who survived, who didn't?

Mr. PITTMAN. The question is whether we can distinguish between the causes of fatalities. We have fatality figures. I think we have very poor information on the causes.

Mr. COHELAN. Well, as a matter of fact, I have seen a study. I am sorry I didn't bring it this morning. I think it has been done under your auspices, one of our scientists at the University of California has done some work in this field and the reference was made to Hamburg and firestorm and the effect on people who went into basements.

Now, this relates, of course, to our studies now on the value of the fallout shelter and its susceptibility to fire damage even though we could get the protection from radiation.

As I recall the study was interesting in that it did show there were very substantial fatalities even though people were in a protected environment, but I think the significance of the data, as I recall it, was that there were an awful lot of people who did survive as well.

But I do think that this ought to be introduced at this point in the record, if you have any quantitative data.

(Information requested follows:)

#### CASUALTIES AND SURVIVORS IN SHELTERS OF THE HAMBURG AIR ATTACK, JULY 27-28, 1943

This paper summarizes the estimated casualties and survivors in shelters, particularly the basement or celler type, of the Hamburg air attack, July 27-28, 1943. The information for this paper is taken from:

"Death From Fire in Large Scale Air Attack—With Special Reference to the Hamburg Fire Storm," by Kathleen F. Earp, Home Office Report CD/SA 28, Home Office Scientific Advisers' Branch, Whitehall, SW1, April 1953.

"Report by the Police President and Local Air Protection Leader of Hamburg on the Large Scale Raids on Hamburg in July and August 1943, Experiences," volume I: Report, I.O.(T)45, Home Office, Civil Defense Department, Intelligence Branch, January 1946.

The U.S. Strategic Bombing Survey reports (Nos. 40, 44 (vol. 1), 154 and 193) on Hamburg have been referenced in the Earp report. The Stanford Research Institute and Lehigh University "Impact of Air Attack in World War II" reports have not been referenced since they are based on the USSBS reports.

TABLE 1.—*Fire storm casualties as percentages of various populations of Hamburg on July 27-28*

Percent, estimated 40,000 killed to estimated 1,500,000 in city of Hamburg--	2.7
Percent, estimated 40,000 killed to estimated 470,000 in area raided (heavily damaged, 22 square kilometers)-----	8.5
Percent, estimated 40,000 killed to estimated 280,000 in fire storm area (13 square kilometers)-----	14.0

TABLE 2.—*Casualties related to 2 basic shelter types*

Shelter type	Location	Experience
Bunkers and splinterproof surface shelters.	"Many bunkers and splinterproof surface shelters were situated in middle of extensive area fire and firestorm zones" (Police President, p. 88).	No casualties from fire (Police President, p. 88). Estimated population in bunkers and splinterproof surface shelters in firestorm area, 53,000 (Earp, p. 10).
Cellar shelters (private and public).	(a) 101 air raid shelters in cellars under houses damaged or destroyed in central part of city but not in firestorm area. (b) In firestorm area-----	Casualties (93 dead, 6 missing, and 46 injured) only occurred in 8 cases (Police President, p. 87).  "In main firestorm area, however, there was a terrifying difference in the proportion [of casualties]" (Police President, p. 87). Estimated population in private and public cellar shelters in firestorm area: 227,000 (Earp, p. 20) of whom: (1) 40,000 were estimated casualties from blast or fire in shelters or from fire after leaving shelter. (2) 45,000 were rescued. (3) 142,000 survived in cellar shelters or fled to safe areas (Earp, p. 14).

Mr. COHELAN. Now, my other question would be: These are technical matters that we are considering and we have heard Dr. Schreiber's testimony and we are hearing this testimony this morning. What is the range of opinion?

#### RANGE OF OPINION ON FIRE

Is there a spectrum of opinion on this fire question?

What is the range or spectrum on this opinion of fire damage? Mr. Kelleher's report commented on some—on fire storms by various commentators and authorities and so on. What is the range of opinion here?

Mr. PITTMAN. I might undertake to answer generally; Dr. Strobe can supplement me.

Among fire experts and people who have studied the military or wartime fire problem, there are differences, but they are narrow. There is a wide consensus on the fundamentals of this problem which are generally consistent with the views you have heard today.

The problem I think—the appearance of a wide difference of opinion comes from people who are technically qualified in other fields undertaking to apply isolated data to the fire problem.

We had an electrical engineer, who was Dr. Schreiber, talking about the fire problem, and I think Mr. Kelleher's memorandum cited a number of people on the fire problem, none of whom were as close to being technically qualified as Dr. Schreiber.

I think Hanson Baldwin was one. There are not very many experts in the country on wartime fire problems; those that exist have their differences, but they are not wide.

Would that be a fair statement, Dr. Strobe?

Dr. STROBE. Yes; I think so, with one addition: that you must distinguish between the opinions of people who are competent in the field who have actually studied the problem of fire ignitions or fires themselves and those that have not.



Within the people who are actively engaged in this research, the range of opinion is, as Secretary Pittman says, quite narrow, but the data we have presented on ignitions is now the accepted data among these people.

The arguments within this area now are whether it should be lower, not higher. The major area of concern where our uncertainties are greatest—where it allows the greatest amount of discussion and opinion among those that are expert in the field—is in the fire-spread problem.

This is an area which we are giving a great deal of emphasis. Again here, as in most cases, the tendency is to state things in a conservative manner; that is, to look at what it could possibly be and state the maximum level. So that, as I have mentioned, it is generally the case that, as we do obtain better information, it tends to bring the problem into a lower focus than is possible in the uncertain region; but by far the fire-spread problem is the most uncertain aspect today of the fire problem.

#### MILITARY VALUE OF INCENDIARY EFFECT

Mr. COHELAN. Assuming the validity of the information that we have before us, wouldn't this indicate to military planners, potential enemies, that if they are going to use this as a basis for attack, that they would select their targets? In other words, what you have said today is that there would be a greater effect in some areas under certain conditions than there would be in other areas.

Now, what is your response to that?

Dr. STROPE. My response to that would be, and I would be simply reciting the response obtained from our targeting people, that very simply they do not consider the incendiary effects of the weapon in their choice of weapon size or point of delivery. It is considered as a bonus, if it occurs; and it is considered to be highly unpredictable and very likely to be absent in many cases.

Mr. BECKER. Mr. Chairman.

Mr. HÉBERT. Are you finished?

Mr. COHELAN. Yes.

Mr. HÉBERT. Mr. Becker.

#### DEGREE OF SPECULATION ON FIRE

Mr. BECKER. Dr. Strobe, you, in answer to a question a few minutes ago, talked about the competence or lack of competence of people in this fire field and also their study and being concerned with it in the Defense Department as experts in this matter.

Yet in reading your statement—and I have gone through it again—I find that many of your statements are based upon speculation or the eventualities under certain conditions, a matter of speculation. Is this correct?

Dr. STROPE. I do not believe it is correct; no.

Mr. BECKER. Well, on page 5, for example, here in this whole long paragraph you say "Another serious problem," and you deal with Dr. Schreiber's using the information in the "Effects of Nuclear Weapons" indiscriminately.

You go on further and say:

As noted on pages 321 and 362 of the "Effects of Nuclear Weapons," the transmission equations overstate the range of thermal radiation effects by an unknown but possibly large factor.

They overstate it. You don't say how and the unknown factor is not qualified. Then you go on:

I call this fact to the committee's attention because, although the Department of Defense is not prepared to recommend a change at this time, additional research can only result in a further reduction of the current estimates of fire ignition.

In other places here there seems to be so much either imagination or I will say much left to speculation as to what might happen under certain conditions. It seems to me that there is not too much of a definitive nature about this in order to apply the matter of competence on whether it is Dr. Schreiber's part and I am not going to defend his arguments, but there seems to be so much lacking in actual facts to determine whether one is absolutely correct or whether the other is correct. It is not definitive so far as I can see it.

Dr. STROPE. You are correct. It is not definitive. I think that the point you have raised in this paragraph is one that, if we spent about 2 or 3 minutes on it, would demonstrate the general character of the scientific problem in this field. With the chairman's permission, could I address myself to this question and in doing so provide this paper. I don't intend to go into this in technical detail, but simply to give you a feeling for what the nature of the problem is.

#### BACKGROUND OF RESEARCH ON TRANSMISSION OF THERMAL RADIATION

Now, the subject of discussion is the transmission of radiation through the atmosphere and we have here a chart in which the transmission factor (some fraction of unity which would mean it would be totally transmitted indefinitely) is plotted against distance, for visibility of 10 miles, which is the average visibility in metropolitan areas. This graph is taken from "Ignition of Materials by Large Yield Nuclear Weapons for Various Burst Heights and Atmospheric Conditions" by J. C. Rogers of Stanford Research Institute, dated May 1963.

Now, let me describe what is on this graph and describe the situation.

The earliest information available in 1951 was data gathered at small yield weapons in Nevada by Stewart & Curcio, represented by the upper lines on this graph labeled Stewart & Curcio.

For many years this was the only data available. It was gathered with the equipment at that time, much of which is primitive compared to today's technical standards. About 1955 additional data was gathered by Gibbons of NRDL. That is the lower line sweeping down here, labeled Gibbons.

Again for many years we had these two sets of data. They disagreed violently. The Stewart & Curcio data says that much of the energy is transmitted at a distance of say 10 miles, at least half of it or more, whereas Gibbons data suggested that very little of it would be transmitted at that distance.

Since these were empirical measurements, there being no theory by which to judge which might be more correct than the other, the decision was made to be conservative and the "Effects of Nuclear Weapons" line is as shown there; it leans a little bit toward Gibbons, but it mainly reflects the Stewart & Curcio data.

In 1960, Chin and Churchill of the University of Michigan developed a theoretical basis for this problem of transmission of thermal radiation in the atmosphere and a check of that theory tended to support the Gibbons data rather than the Stewart & Curcio data.

In 1962, just a year ago, Cahill, Ganvin, and Johnson of the Air Force Cambridge Research Laboratories up in Massachusetts developed a more detailed theory. It is described in the curve here labeled C. G. & J., and it again supports the Gibbons data.

If you were just looking at this from a technical point of view, you would say at this time that the weight of evidence is in favor of the Gibbons data and the theory that supports it.

The fact is that, as I said in my testimony, the Department of Defense is not yet prepared to make that drastic change which would further reduce the extent of the problem. The work is going on to attempt to substantiate this further, but I say that the results either will leave the data where it is or move it lower. I simply leave it to the judgment that the difference could be a large one. I am sorry but it is usually the case in science that almost never can you be certain. This is the material behind that particular paragraph. It is representative of the sorts of things that we must deal with in this area.

Mr. BECKER. This is the very point I was trying to make in my statement, Doctor. Here you have got four, Stewart & Curcio, "Effect of Nuclear Weapons," C.G. & J., and you have Gibbons.

This seems to be wide apart here. Are they experts in this field?

Dr. STROPE. These are workers in the field, that is right.

Mr. BECKER. Workers in the field, yet they are far apart. Why is one to conclude that Dr. Schreiber isn't just as wide apart as these two?

Dr. STROPE. In this particular area we are still using the same information that Dr. Schreiber is using, "Effects of Nuclear Weapons," but what I am warning is that the situation is not like that, that there is a strong possibility there may further be a change.

Mr. BECKER. So that at the present moment with this chart, with the statement of Dr. Schreiber, with yourself, there is a great deal of speculation in this field.

Dr. STROPE. This is not speculation; this is primarily two sets of data, one supported at the current time by theory and the other not.

Mr. BECKER. One supported by theory and the other not, but they are just as far apart.

Dr. STROPE. That is right. The two sets of data convey quite different conclusions.

#### SECRETARY OF DEFENSE M'NAMARA'S POSITION ON CIVIL DEFENSE

Mr. BECKER. Now, I would like to ask this question, Doctor, if I might: You say on page 8:

The position advanced by the Department of Defense is that an effective system of fallout shelters is an essential element of any reasonable civil defense effort and that there are low-cost ways of achieving this essential protection.

Now, when did the Department of Defense arrive at that conclusion, because it wasn't a conclusion a year and a half ago of the Defense Department. When did they arrive at this conclusion?



Dr. STROPE. This has been the position, I believe, and I think the Secretary is probably better able to respond to this than I am—it was the basis for the initial program upon transfer of civil defense to the Department of Defense.

Mr. BECKER. You mean at that time it became the position of the Defense Department, when it was transferred from the Department of Defense to civil defense?

Mr. PITTMAN. At the time it was transferred a task force which encompassed most elements of the Department of Defense that had something to offer on the subject of the effects of nuclear war examined the spectrum of problems and came to this conclusion, that the opportunity for a large lifesaving return for a relatively small investment lay in the area of fallout protection, which is the burden of this sentence as I understand it.

Mr. BECKER. Now, I am not trying to make a big deal out of this, but it seems to me it was only about a year and a half ago when the Secretary of Defense, if not entirely, at least in a statement, was opposed to fallout shelters or he was, shall I say, if not opposed, he didn't express a position in favor of fallout shelters?

Mr. PITTMAN. But may I—

Mr. BECKER. Let me go on and you can answer it all at one time. Now, weren't all of the same people or many of the same people tied up in the Office of the Department of Defense, many of the same people now transferred into your Department of Civil Defense, is this true?

Mr. PITTMAN. This is correct.

Mr. BECKER. Then is the Secretary's position changed or has the position changed of those advisers who were in the DOD and now in your department?

Mr. PITTMAN. Well, I have to say, Mr. Becker, that in my opinion neither one has changed and I have searched fruitlessly to find this evidence that the Secretary's position has changed.

Mr. Kelleher's memorandum quoted him out of a television show to the effect that it is a matter for private initiative, this was the tail end of a statement in which he was saying the Federal Government, State and local governments, and the private citizen have responsibilities to do this. It was taken out of context. Weeks before that the Secretary, in August of 1961, testifying before the House Government Operations Committee on the Defense Department's plans for implementing this new responsibility was extremely definite and clear that fallout shelters were the key to the problem, that community shelters were the effective way of meeting this problem, not home shelters; home shelters would be a supplement at best.

Therefore, I fail to see how—I think he said at that time also that the survey would have to be followed by the kind of program we are discussing here and that that should take place probably before the survey was completed.

He said this in August of 1961, which is just about 2 years ago. In any event, I would like to assure you that on my own personal knowledge his views on this have not changed, nor have the President's. They see the problem pretty much the same way they saw it after studying the results of this task force.

## THE ABO SCHOOL, ARTESIA, N. MEX.

Mr. BECKER. Mr. Chairman, I would like to ask your permission because I don't know whether I can be here this afternoon—I would like to ask one question and have it clarified that does not relate to this testimony here right now. It goes back to testimony prior. It has to do with the Artesia, N. Mex., school district, the Abo School District. In that case, if we understand it, and you heard the testimony, they designed and they built a school, because of their unique conditions there, to build it beneath the ground, they designed it, they had architectural designs and they had nothing in their plans at the time or consideration that this would be a fallout shelter. This was the testimony, I am quite certain.

Mr. PITTMAN. With one correction. They designed a windowless, aboveground building without shelters in mind; then they put it underground.

Mr. BECKER. The testimony here was that they designed it below ground because of windstorms, because of heat conditions and other conditions and they designed it to build below the ground. This was in the testimony; I am positive we can go back and check it out, and all the questioning.

Mr. PITTMAN. Right.

Mr. BECKER. Then after they had prepared their plans at a cost of some \$484,000, somewhere in that immediate figure, somebody got the idea to apply for civil defense funds and they applied to HEW. HEW did not agree and sent them to civil defense. Your Department then agreed and allocated through HEW about \$130,000 or approximately 25 percent of the cost of that construction.

Mr. HÉBERT. I think——

Mr. BECKER. Wasn't it \$130,000?

Mr. KELLEHER. \$134,000.

Mr. BECKER. 134; I am using round figures. Four thousand doesn't mean much in the billions, Mr. Chairman.

Mr. HÉBERT. I am thinking, Mr. Becker, at the testimony, that subsequently the Secretary sent to the committee a letter which would explain this——

Mr. BECKER. Do I have it?

Mr. HÉBERT. We do have the letter, not here. Just for the sake of brevity at the moment, the funds, as I recall, were for a pilot plan through Defense Department. The HEW funds were for the study to be made. That was the \$50,000 grant by HEW to the State, but the funds for the building came directly from the Department of Defense.

Mr. BECKER. To the school district and not through HEW.

Mr. HÉBERT. I think that is correct.

Mr. BECKER. Is that correct?

Mr. PITTMAN. That is right.

Mr. BECKER. It came directly from the Department of Defense to the Abo School District?

Mr. PITTMAN. That is correct.

Mr. BECKER. To build a school?

Mr. PITTMAN. Yes. This was in the nature of a research project. We call it the prototype program.

Mr. BECKER. None of this was testified to by the people from the Abo School District of Artesia, N. Mex. I think we can go back to the testimony and I am going to go back and get that out; their testimony is what I am basing my statements on. They applied for and received 25 percent. Does it follow that if we build schools all over this country, in my district, to my district will they allocate 25 percent?

Mr. PITTMAN. No, they will not.

Mr. BECKER. If they build it in a similar fashion?

Mr. PITTMAN. I certainly want to make a clear distinction between the precursor to this program which was the prototype experimentation in the problems of building shelters into various kinds of buildings and our proposal for a practical, realistic method of providing financial assistance to broad categories of institutions across the country.

Mr. BECKER. Now, with this, your position of its being a prototype, an experiment, would be fine, Mr. Pittman, providing the school district and the people started out with this idea in mind, but their testimony did not and they admitted that they had no idea that this would be a fallout shelter.

They merely, when they found out there might be funds for this purpose, then applied for its use as a fallout shelter, by building—well, they built a heavy concrete roof on to this so that they could use it for playgrounds and tennis courts or other purposes.

Mr. PITTMAN. I can assure you that the fact is, and my recollection is the testimony is consistent with the fact, that they became interested in this project through building an earlier above-ground windowless building without any Federal assistance or without any thought of shelters; then the idea came to them, "Well, we can put the same structure, because it has no windows, under the ground," and they approached the Federal Government to see if they would be interested in providing assistance on a research experimental basis for an underground school which would be a shelter.

Mr. BECKER. Well, I just have in mind that we have no legislation for Federal aid for primary and secondary schools and this was an indirect aid—

Mr. PITTMAN. Yes.

Mr. BECKER (continuing). Just the same. And I still think there is something somewhat inconsistent between your explanation and the testimony and I am going to dig it out this afternoon and read the testimony given by the people who were here representing the school district.

Mr. PITTMAN. I assure you that the plan we have before you is not to do this kind of thing. This was a program of our predecessor agency which called for a very much more expensive standard of shelter protection, protective features in buildings than we are now proposing.

It is quite a different animal. It is, of course, of historical interest and we should clear up the record.

Mr. BECKER. I would just like to say in conclusion that we start off many programs, never having those things in mind, but we find eventually—you can check with many departments—they start branching up into these things and they get out of hand as far as we are



concerned, and the money that we appropriate is going for things we never intended.

Mr. PITTMAN. Mr.—

Mr. BECKER. I just want to make sure that we had the record straight on that.

Mr. PITTMAN. I must say I am very sympathetic to what you are saying and insofar as it is in my power or ingenuity to do it, we are going to build in protections against that kind of development and we hope we will have your help when we get down to looking at this bill and making sure that the program cannot wander off in unexpected directions.

Mr. BECKER. I am sorry to have diverted, Mr. Chairman.

Mr. HÉBERT. That is all right.

ASSISTANT SECRETARY OF DEFENSE,  
CIVIL DEFENSE,  
Washington, D.C., June 28, 1963.

HON. F. EDWARD HÉBERT,  
*Chairman, Subcommittee No. 3,  
Armed Services Committee,  
House of Representatives.*

DEAR MR. CHAIRMAN: You have requested a report on the Abo School fallout shelter project in Abo, N. Mex. The Abo School prototype fallout shelter was initiated as a part of the prototype shelter program conducted by the Office of Civil and Defense Mobilization. This was the agency previously responsible for the civil defense program before the program was transferred to the Department of Defense.

This prototype program in part implemented the OCDM policy statement on shelters in 1958. One of the elements of that policy was the statement that the Federal Government would construct a limited number of prototype shelters of various kinds which could be tested and demonstrated and which would have practical dual uses. These prototype shelters were to be incorporated into homes and various types of buildings including "additions to existing schools and new schools, including such facilities as cafeterias, assembly spaces, and classrooms." Others were to be incorporated into homes, hospitals, State office buildings, understreet areas, and the like.

The prototype program was a research and demonstration program. It was not a public shelter program. The program relied, legally speaking, upon the existing authority in the Federal Civil Defense Act to conduct research and to disseminate information about civil defense and, as a necessary incident to these activities, to engage in limited construction.

Section 201(d) of the Federal Civil Defense Act of 1950, as amended, authorized the Office of Civil and Defense Mobilization to "study and develop civil defense measures designed to afford adequate protection of life and property, including but not limited to, research and studies as to the best methods of treating the effects of attack; developing shelter designs and materials for protective covering or construction; and developing equipment or facilities and effecting the standardization thereof to meet civil defense requirements."

Section 201(f) authorized the Office of Civil and Defense Mobilization to "publicly disseminate appropriate civil defense information by all appropriate means" and section 201(h) authorized it to "procure by condemnation or otherwise, construct, lease, transport, store, maintain, renovate, or distribute materials and facilities for civil defense."

The term "facilities" is defined in section 3(e) to include buildings and shelters.

That study and development of the sort conducted in connection with the Abo School was authorized is supported by the legislative history of the Federal Civil Defense Act.

Mr. Durham, in a discussion of section 201(d) on the House floor, cited as an example of the type of research contemplated by the section "developing communal and family types of protective shelters." This in addition to the development of designs for shelter.

After the announcement by the Office of Civil and Defense Mobilization of its policy on shelter, it requested an appropriation for the purpose of con-

structing some actual prototype shelters which could give some actual experience in the area.

The standards and criteria of the Office of Civil and Defense Mobilization for community shelters, it might be remarked, were more rigid than those now in effect including, for example, requirements relating to auxiliary water and power supplies and initially a protection factor of 1,000. Also, at that time, the techniques and standards for the national shelter survey had not been fully developed. Another part of that program of the Office of Civil and Defense Mobilization included a shelter survey on a sampling base. The information developed there was most helpful in the later conduct of the national shelter survey.

In its justification of the budget submission for the prototype shelter construction, and in its testimony in support thereof, the Office of Civil and Defense Mobilization clearly indicated that part of the funds would be used for the construction of school fallout shelters.

The 1960 Independent Office Appropriation Act appropriated \$2,500,000 for the purpose of constructing prototype shelters (Public Law 86-255). Another \$2,500,000 was appropriated for fiscal year 1961 (Public Law 86-626). All of the projects were initiated by the Office of Civil and Defense Mobilization prior to the transfer of functions to the Department of Defense. No prototype shelters for schools have been initiated by the Department of Defense. In addition to the Abo School, prototype shelters were incorporated in elementary schools in San Diego, Calif., North Arvada, Colo., and Rockville, Md.

The Abo School project was entered into under an agreement dated November 17, 1960. The purposes of the agreement were spelled out in a series of whereas clauses. These are:

"Whereas, in accordance with the national policy on shelter, the Federal Government is conducting, for purposes of research and demonstration, a program to construct and use throughout the country prototype shelters of various kinds, including in schools currently being constructed, the incorporation of shelters to provide protection against the hazard of radioactive fallout; and

"Whereas, there is to be immediately constructed in Artesia, N. Mex., a new school known as the Abo School; and

"Whereas, in carrying out its civil defense responsibilities, the owner desires to cooperate with and assist the Government in the conduct of the above-described activities by designing and constructing an area within the school, said area being hereinafter referred to as the protected area, which will provide protection for the occupants of the school from the hazard of radioactive fallout under nuclear attack conditions, and which can function independently and effectively under said conditions."

These clauses clearly indicate that the purpose for which the Federal Government made funds available to the Abo School was for shelter features only. The Government was to pay only for shelter features under the agreement. The Government was to pay only for the additional cost incurred as a result of the addition of shelter features to the school. (The placing of the school underground, rather than making it a windowless school like another one in Artesia.) In the case of the particular agreement, this was defined as follows:

"It is agreed that the 'additional shelter cost' is an amount equal to the difference between the actual cost of construction of the protected area with the protective features contained therein and as an underground facility, and the cost of construction of the protected area, as estimated by the Government, without the protective features contained therein and as an aboveground facility."

This was ascertained in the case of the Abo School by the use of alternative bids. Bids were received on both above and below ground structures. These were evaluated, the differential determined, and the consideration set.

Had the Abo School been constructed as an aboveground, windowless school it would not have provided shelter features particularly of the type then being considered by the Office of Civil and Defense Mobilization. The entire facility has a protection factor in excess of 1,000 whereas the current minimum standard for new construction is 100. In order for the school to meet the OCDM shelter standards it was necessary to bury it. This was done.

The Abo project was purely an experiment. Much has been learned from it, much has been learned since it was initiated. It is now known that burying a school underground is not necessary and that adequate protection can be obtained in less radical fashion and with less rigid criteria. This has been amply demonstrated by the Department of Defense school design competition.

Nevertheless, the experiment at the time conducted was valid and furnished, and is furnishing, valuable information.

The research project conducted by Dr. Lutz was funded out of a Department of Defense research appropriation made pursuant to section 201(d). The Office of Civil Defense does not maintain an "in-house" research force. Further, where possible, it uses the existing capabilities of other agencies. As Mr. Durham said in discussing the section,

"The administration would naturally utilize the agencies best qualified to conduct such research and would avoid duplication."

The Office of Education of DHEW is the Federal agency with the best capability in this area. Therefore, maximum use was made of its resources and capabilities.

The research itself was aimed at determining whether there was validity to the charges that a shelter environment (in this case, an underground shelter) would have adverse effects upon the children. It is believed that considerable worthwhile information on the subject was obtained.

Sincerely,

STEUART L. PITTMAN.

Mr. HÉBERT. Mr. Bray.

#### EFFECT OF ATMOSPHERE ON TRANSMISSION OF THERMAL RADIATION

Mr. BRAY. Is there any reason why this figure 2 chart entitled "Variation of Atmospheric Transmission With Range and Visibility" cannot be placed in the record?

Dr. STROPE. Not at all.

Mr. BRAY. I wish it was. I hope it is, because I think there has been altogether too much misunderstanding about very many phases of civil defense. In fact, it was brought out earlier on certain matters which were classified that at least it was the unanimous opinion of the subcommittee who discussed it that it certainly should not be classified; that the people should know the facts.

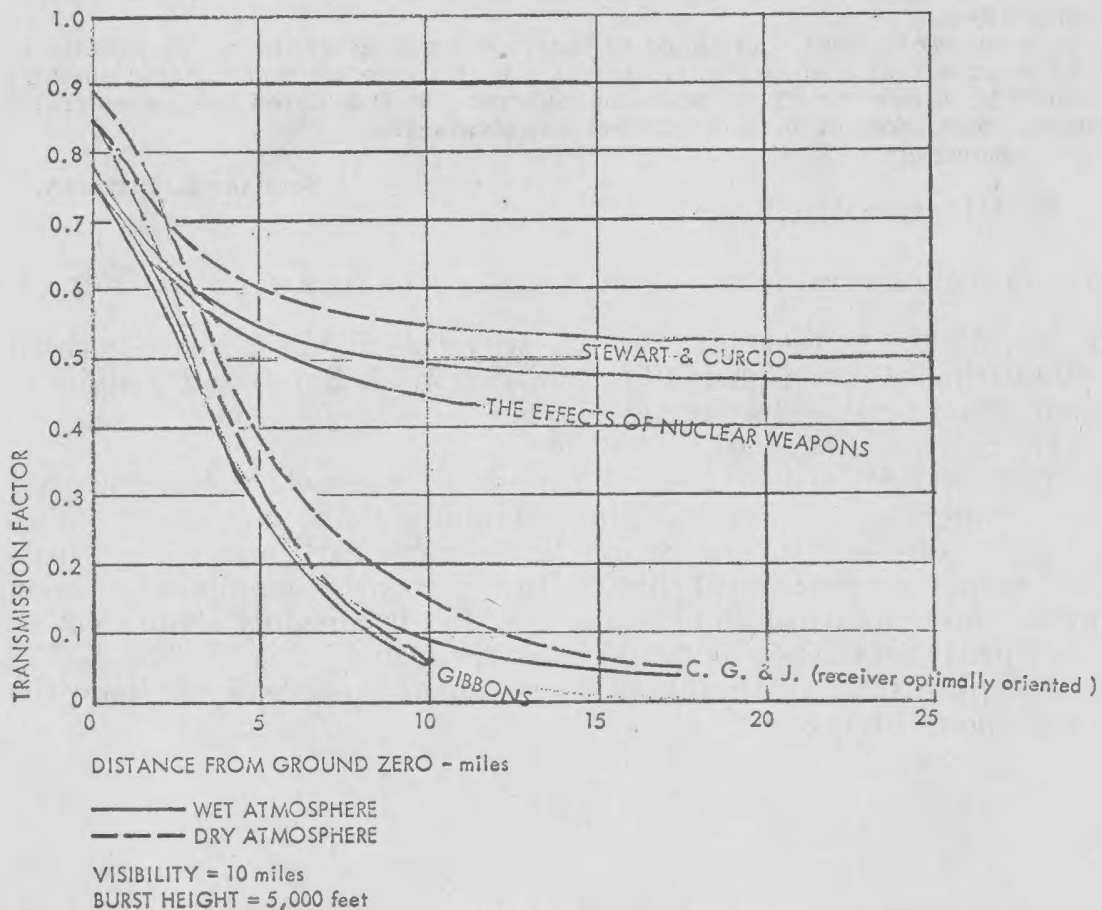
I think that is one trouble perhaps, that the people do not know the facts about this matter.



(The chart referred to follows:)

FIGURE 2

VARIATION OF ATMOSPHERIC TRANSMISSION  
WITH RANGE AND VISIBILITY  
COMPARISON OF COMPUTATIONAL TECHNIQUES  
(Receiver normal to radius vector)



#### DR. SCHREIBER'S CONCLUSIONS

Mr. BRAY. Also, since you were mentioning it, there has been quite a bit of testimony here as to the previous testimony of Dr. Schreiber.

As I recall, while there are certain fundamental differences in scientific conclusions made by Dr. Schreiber and by yourself, yet as I recall, the principal difference in the testimony is that he had determined in his own mind that they would make airbursts and not surface bursts, isn't that correct?

Dr. STROPE. More precisely, high-altitude bursts rather than low airbursts.

Mr. BRAY. That is right. High-altitude instead of the lower bursts.

Dr. STROPE. That is correct.

Mr. BRAY. And most of his conclusions were based upon that premise, which if he was right, at least some of his conclusions would be correct; if he is wrong, they certainly would not be correct.

Dr. STROPE. Mr. Bray, he reached this conclusion based on his estimate that the reach of fires would be very great and what we are saying is they would be very small, and therefore this is not a reasonable position to take.

#### THE EFFECT OF ORGANIZATION ON FIRE CONTROL

Mr. BRAY. Yes; I recall that. I am just clarifying that. Only one more matter.

There has been testimony concerning the fires in Hamburg in World War II—there has been no mention of those in Tokyo to Yokohama. Between Yokohama and Tokyo the incendiary bombs did kill more people than the atomic blast at Hiroshima and Nagasaki. I was there shortly after, in the period of occupation, and I was told at that time that as long as the Japanese remained there and put out the fires, the fires did not do terrible damage. But that night there was an especially heavy bombardment and strong winds, yet they were still successful until suddenly panic seized the people.

I mentioned this because while this bill has to do with organization, regardless of any program you have, unless there is proper organization of the people, it is going to fail.

The theory was that night suddenly panic did hit a few and they started running and they all ran and consequently the slaughter was enormous and the whole area was destroyed; You could ride for miles and miles. They suddenly left and that was responsible for perhaps the greatest damage that Japan suffered. That information has nothing to do with this, except it does have something to do with civil defense, a lot to do with the civil defense program.

Mr. PITTMAN. Very definitely.

#### IGNITION RADIUS

Mr. PIKE. I would like to first ask Mr. Pittman, in your new yellow booklet where you show the ignition radius on these two charts, are you showing that radius based on the criteria set forth by the "Effects of Nuclear Weapons" or on the criteria on the later studies?

Mr. PITTMAN. Now, I am going to ask Dr. Strobe to correct me if I give you the wrong answer because he knows more about this than I. But I think the situation is this: That there are two elements involved from the "Effects of Nuclear Weapons." One is the number of calories required to ignite kindling fuels and the other is the reach of the thermal pulse, the heat that will cause the fire.

On the first we are saying the "Effects of Nuclear Weapons" is clearly wrong, Dr. Schreiber didn't know this; we do. Our charts are corrected to show this new information.

On the second, Dr. Strobe has indicated that he anticipates a change in the "Effects of Nuclear Weapons." It has not yet been decided upon. We are sticking to the published version of the "Effects of Nuclear Weapons" which Dr. Schreiber used.

Mr. PIKE. As far as the heat transmission factor you are using the new criterion?

Mr. PITTMAN. The old.

Dr. STROPE. The old.

There has been no decision to revise this as yet, but as far as ignition levels this is the new information, and it is reflected in the yellow book, charts 1 and 2.

Mr. PIKE. This is getting a little too technical for my layman's mind, I don't mind telling you. But it does seem to me that you are perhaps being a little unfair to Dr. Schreiber when you come in and attack his statement on the basis that he is using out of date criteria and out of date standards when you, yourself, in a booklet that you just put out this month, are using them too.

Mr. PITTMAN. I think it is a very well taken point. This hearing has been an extremely useful event. I think in the course of this hearing on civil defense, we have been stimulated in the Defense Department into getting out information which wasn't before made public and I think should have been, and I make no apologies for this. But Dr. Schreiber, of course, exposed himself to this problem when he undertook to make as comprehensive an explanation of this problem of nuclear war as he did without checking with us first to see if there was any new data which might influence his decision.

Mr. PIKE. It seems to me that we have all exposed ourselves to this problem and we have got to live with it, but the problem is, as I see it today, that we, as laymen, have a job of deciding between the relative merits of two chunks of technical testimony and Dr. Strobe comes in here today and says that Dr. Schreiber's testimony is wrong because he has used some out-of-date figures on the transmission effects and yet you come in with a brandnew booklet using the same figures that Dr. Schreiber has used.

I simply don't see how you can knock him for using them if the Department of Defense is still putting out the same criteria.

Mr. PITTMAN. Let's not knock him, but am I not right that we put this information out in other weapons effects analysis; this is not the first time that these fire radii have been revealed.

Dr. STROPE. No, they were published over a year ago. I might add that the information in the fallout protection booklet put out in January 1962 describing a 5-megaton surface burst on page 9 are completely consistent with the chart No. 1 here and they were freely available and widely distributed at that time.

Mr. PIKE. On the other hand, the figures that Dr. Schreiber has used are taken from table 7.44 of the "Effects of Nuclear Weapons" which was published in—well, the current edition at least was published in 1961 and I don't see how you can knock him for using those standards either.

Mr. PITTMAN. I agree with you. If I were he I would have used them too in spite of the booklet put out by the Civil Defense Office last year.

Mr. PIKE. You say, Dr. Strobe, that it was determined that you weren't going to change these criteria until a new set of measurements could be obtained to corroborate the NRDL data. The new measurements have been completed and fully corroborate the NRDL findings. Why don't you throw out the old ones?

Dr. STROPE. As I follow on these, I say that estimate nuclear heat required for ignition are being thrown out in the book that is currently under revision and we are planning to make a revision in the "Effects of Nuclear Weapons." The reach of thermal radiation is likely to be changed also, but no final decision has yet been made.



Mr. PIKE. Here is a book dated July of 1963, prepared largely at the request of this committee to get some of this stuff out of the classified document. It is based, as I gather it, at least in part on the old criteria which you knock Dr. Schreiber for using.

Dr. STROPE. No, it is based——

Mr. PIKE. I pursued this as far as I want to pursue it, Mr. Chairman, but it does seem to me that we are being told that the old standards as to what it takes at certain ranges to make a piece of paper ignite from a fireburst or from an atomic burst in the atmosphere are not valid, and we don't know, at least I don't know what is valid and what isn't, but I do think that the Department of Defense is showing a tremendous inconsistency in what they present to us as the last word in the standards to be used.

Mr. PITTMAN. While agreeing with you, Mr. Pike, may I say that, while not admirable, it is quite typical of the processes of government that there is a lag between the original work and publication, the clearance with all of the people in government who are interested in this subject.

Mr. PIKE. Would it be fair to say this, Mr. Pittman, that in every instance where such an inconsistency exists, you have bent over backward in an effort to be conservative and to be on the safe side in your predictions as to these effects?

Mr. PITTMAN. This is certainly fair to say and I think one of the difficulties we have with public understanding of the subject is that over the last 10 years the tendency to be conservative in government on these subjects has been so extravagant that it has been highly misleading.

Mr. PIKE. Furthermore, you are going to catch some kind of devil when you do attempt to change your criteria because people are going to say, "Well, the damage is just the same today as it was 10 years ago, and you are just changing your criteria because you want to sell a fallout shelter program."

Is this one of the considerations that is motivating the reluctance to accept these new criteria?

Mr. PITTMAN. This is one of our problems, but I think to see the full problem it is important to recognize that the Defense Department, after it took the program over, did undertake to get out an official, comprehensive, authoritative source of information on this and it came out in the form of this little booklet "Fallout Protection." You may remember that it was in the newspapers for months before it came out. The President had promised to inform the country.

Now, in that booklet is the same general information we are giving you today. It has been available to the public since January of 1962. So I think we did our job, but the trouble is that a booklet from a government agency that is responsible for a program doesn't have weight with many thinking people and scientists and so on. They look to a different type of source.

Mr. PIKE. It just has weight with nonthinking people and Congressmen, is that right?

Mr. PITTMAN. Well, there is problem of even getting it read on this particular subject, but that comment I think should be associated with yours.

Mr. PIKE. That is all, Mr. Chairman.